

REMARKS

This paper is in response to the official action dated October 15, 2009 (hereafter, “the official action”). This paper is timely filed as it is accompanied by a petition for extension of time and authorization to charge our credit card account in the amount of the requisite fee. The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 13-2855, under Order No. 29610/CDTCDT386.

Claims 1-17 are pending, but claim 5 has been withdrawn as directed to a non-elected invention. By the foregoing, claims 1 and 13 have been amended to recite n is a number from 1-2 (as typically square planar or octahedral complexes are formed according to the claimed methods), and claim 14 has been canceled without prejudice or disclaimer. No new matter has been added.

All claims 1-17 have been rejected §35 U.S.C. §112, first paragraph, as assertedly not enabled.

Claims 1, 2, 5, 8, 10-15, and 17 have been rejected as assertedly anticipated by (i) EP 1239526 to Tsuboyama, (ii) EP 1349435 A1 to Kamatani, (iii) Lamansky et al., Inorg. Chem., 40:1704-1711 (2001), and (iv) International Patent Publication No. WO 02/15645 A1 to Lamansky et al.

Claims 13 and 14 have been rejected under §35 U.S.C. §112, second paragraph, as assertedly indefinite.

Claims 1-5 and 8-17 have been rejected under 35 U.S.C. §103(a) as assertedly obvious over EP 1,349,435 to Kamatani. Claims 1-17 have been rejected under 35 U.S.C. §103(a) as assertedly obvious over WO 02/15645 A1 to Lamansky et al.

INITIAL COMMENTS

With respect to the statements at pages 3 and 5 of the action suggesting/stating that “it is required that all claims be amended to (the) elected group,” there is no proper basis for making such a requirement. *An election of species does not require an applicant to amend the claims to read on that species.* The applicants respectfully submit that at least one generic claim, as pending, is patentable over the applied art for the reasons given herein, and thus the proposed requirement is premature.

CLAIM REJECTIONS 35 U.S.C. §112, 1st PARAGRAPH

All pending claims 1-17 have also been rejected as assertedly not enabled. The applicant respectfully traverses the rejections.

The proper focus of the enablement inquiry is whether it would take undue experimentation for one of ordinary skill in the art to fully practice the scope of the invention. The applicants respectfully submit that the nature and quantity of experimentation necessary to practice the full scope of the invention is not undue or excessive. Any experimentation needed to practice the claimed invention is routine and within the scope of permissive experimentation as defined by *In re Wands*, 858 F.2d 731 (Fed. Cir. 1988), as explained in further detail below.

The examiner acknowledged the disclosure as being enabling for n=3, but not for n being 1 and 2. The examiner misconstrued the claims and/or the application disclosure. The present disclosure specifically exemplifies iridium halo-bridged dimers, i.e., where n = 2. Iridium and rhodium are well known to form such halo-bridged dimers, i.e., where n = 2. Pt and Pd are well known to form halo-bridged dimers, i.e., where n=1. The literature and the cited art are replete with examples of the foregoing halo-bridged dimers, and the present disclosure clearly demonstrates to one having ordinary skill how to form metal complexes, as claimed. The rejection should be removed.

The examiner also appeared to acknowledge the disclosure as being enabling for “Ar¹ and Ar² being substituted Br and unsubstituted”¹ and vis-à-vis WO 02/15645 for “Ar¹ and Ar² being pyridinyl and phenyl substituted with only alkyl and fluorines which is exactly [that] which Applicant is [*sic*] enabled.” The examiner asserted that the claims are not enabled, however, where Ar¹-Ar² and L are selected from other aryl and heteroaryl groups. *See* page 4 of the action.

It is not entirely clear as to whether the examiner intended to again reject the claims as not enabled for metals other than Ir, as maintained in previous actions, and thus the applicants provide additional explanation regarding same below.

¹ The intended meaning of the “Ar¹ and Ar² being substituted Br and unsubstituted” is not well understood.

The applicants again respectfully submit that the exemplified disclosure set forth in the working examples may be extrapolated to other metals, diaryl moieties Ar¹-Ar², and ligands, as claimed, in view of the general knowledge of one of ordinary skill in the art, as evidenced by the instant specification and (at least) the documents applied against the pending claims.

With respect to the examiner's previous recognition that iridium is enabled, and previous assertion that rhodium is not enabled, one of ordinary skill would immediately recognize that rhodium and iridium are isoelectronic species, and thus would have a reasonable expectation that these metals would behave similarly under similar reaction conditions, i.e., that these metals form the same kinds of coordination complexes. Consistent with this assertion, the Office is respectfully directed to the first and second paragraphs of Lamansky et al., *Inorg. Chem.*, 2001, 40:1704-1711 (2001), which confirm that these metals do in fact form the same kinds of coordination complexes. This assertion can also be confirmed by referencing Tables 1-1 through 1-16 of EP 1349435. Moreover, Lamansky et al., *Inorg. Chem.*, 2001, explicitly discloses several octahedral iridium halo-bridged dimers with a number of different diaryl moieties Ar¹-Ar², each of which would also be expected to form similar complexes with rhodium. *See Id.* at Reaction Scheme 1 and Figure 1, for example.

Like rhodium and iridium, platinum and palladium are also well known to form halo-bridged metal dimers. *See*, for example, WO 02/15645 at page 43, which explicitly references a synthetic strategy for forming platinum halo-bridged metal dimers, and pages 44-48, which discloses a number of different of number platinum halo-bridged metal dimers having different diaryl ligands. As platinum and palladium are also isoelectronic, one of ordinary skill would have a reasonable expectation that these metals would behave similarly and form the same kinds of coordination complexes.

Moreover, numerous iridium, rhodium, platinum, and palladium coordination complexes with a number of different diaryl ligands are specifically described, for example, in WO 02/15645, EP 1239526, and EP 1349435, which were applied against the claims and are of record in this application. Additionally, the application itself discloses a number of diaryl moieties Ar¹-Ar², and ligands, as claimed, at pages 11-12, and references WO 02/15645 (also applied against the claims), as disclosing other

examples of suitable diaryl moieties Ar¹-Ar², and ligands, as claimed. Despite the examiner's comments to the contrary, WO 02/15645 demonstrates more than "Ar¹ and Ar² being pyridinyl and phenyl substituted with only alkyl and fluorines." See WO 02/15645 at page 42, and Figures 5a-5d, for example. Moreover, the diaryl moieties Ar¹-Ar², as claimed, *form at least one carbon-M bond by reaction of M with a carbanion of Ar¹-Ar²*, and ligand L, as claimed, is a compound of formula Ar¹-Ar² which *forms at least one carbon-M bond by reaction of M with a carbanion thereof*.

Accordingly, the applicants respectfully submit that a large number of halo-bridged dimer complexes have been disclosed and/or are readily attainable in view of the prior art. Moreover, such complexes are known to form the metal complex end products recited in the pending claims. *The differences between the presently claimed invention and the cited art relate to the method in which the metal complexes are prepared.* In view of the foregoing analysis of the cited art and the extensive knowledge in the art itself, the applicant respectfully submits that the exemplified disclosure of the working examples may properly be extrapolated to other metals, diaryl moieties Ar¹-Ar², and ligands, in view of the general knowledge of one of ordinary skill in the art, as evidenced by the instant specification and (at least) the documents applied against the pending claims.

In view of the above comments, the applicants respectfully submit that the enablement rejections have been overcome and should be withdrawn.

CLAIM REJECTIONS 35 U.S.C. §112, 2nd PARAGRAPH

Claims 13 and 14 have been rejected as assertedly indefinite for reciting the term "metal complex".² The applicant respectfully traverses the rejections.

A claim is considered definite as long as "the scope of the claims is clear so the public is informed of the boundaries of what constitutes infringement of the patent." See M.P.E.P. §2173. Here, one of ordinary skill would readily understand the scope of the term "metal complex" in view of the accompanying description and the teachings of the prior art. Consistent with this assertion, the applicants attach hereto as Attachment A description of the term "metal complex" from an inorganic chemistry textbook, which constitutes evidence regarding the understanding of one of

² The rejection of claim 14 is moot in view of its cancellation.

ordinary skill in the art.³ Further, the term is a well understood term of art in the chemical arts. Moreover, the metal complex end product of claim 13 is defined by the claimed method steps and the claimed halo-bridged dimer starting material.

In view of the foregoing, the indefiniteness rejection should be withdrawn.

CLAIM REJECTIONS 35 U.S.C. §102

Claims 1, 2, 5, 8, 10-15, and 17 have been rejected as assertedly anticipated by (i) EP 1239526 to Tsuboyama, (ii) EP 1349435 A1 to Kamatani, (iii) Lamansky et al., *Inorg. Chem.*, 40:1704-1711 (2001), and (iv) International Patent Publication No. WO 02/15645 A1 to Lamansky et al.⁴ The applicant respectfully traverses the rejections.

In order to anticipate any of the pending claims, the applied documents must disclose each and every feature *as arranged* in the claims. *See, e.g., Net Moneyin Inc. v. Verisign, Inc.*, Appeal No. 07-1565, Slip Op. at 15-16 (Fed. Cir. Oct. 20, 2008) (“[O]ur precedent informs that the ‘arranged as in the claim’ requirement applies to all claims and refers to the need for an anticipatory reference to show all of the limitations of the claims arranged or combined in the same way as recited in the claims, not merely in a particular order.”); *see also, Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989) (“The identical invention must be shown in as complete detail as is contained in the patent claim.”). There are no examples or other specific disclosure in any of the applied documents that can meet this standard. Consequently, anticipation rejections cannot be sustained, as a matter of law.

Claims 1, 2, 5, 8, 10-13, 15, and 17

None of the cited art discloses or even suggests forming a metal complex of formula M(Ar¹Ar²)_nL by reacting a halo-bridged dimer complex according to formula (I) with a bidentate ligand L of formula Ar¹-Ar² in the presence of an enabling ligand, as claimed.

Each of the applied documents merely discloses reacting a halo-bridged dimer with a bidentate ligand such as acetylacetone (“acac”), picolinic acid (“pic”), or an alkylsalicylimine (“sal”), to break the stable chloro-bridged dimer and form

³ Shriver et al., “d-Metal Complexes,” *Inorganic Chemistry*, p. 191, Oxford University Press (1990).

⁴ The rejection of claim 14 is moot in view of its cancellation.

monomeric complexes. The applied art specifically teaches that the monomeric complex must then be *isolated and/or purified*, and *further reacted in a separate step* with a second bidentate ligand, which is capable of forming at least one carbon-to-metal bond with the metal of the complex to obtain metal complex of formula $M(Ar^1Ar^2)_nL$, as claimed. Thus, the prior art invariably involves two steps to form the desired metal complexes.

While acac, pic, and sal can be interpreted as enabling ligands capable of breaking the halogen bridge of the complexes, they are not ligands L of formula Ar^1-Ar^2 capable of forming at least one carbon-to-metal bond with the metal, as claimed. The art invariably discloses the obtained acac, pic, and sal monomeric complexes must be further reacted to obtain the desired product $M(Ar^1Ar^2)_nL$. See, for example, Lamansky et al., *Inorg. Chem.*, 40:1704-1711 (2001), at page 1707, which discloses “The $C^N_2Ir(acac)$ complexes can then be used to prepare IrC^N_3 .”

The synthetic schemes illustrated at page 50 of EP 1349435 and pages 31-32 pf EP 1239526 demonstrate this very point; two separate synthetic reactions are used to prepare the exemplified tris-diaryl metal complexes.

Accordingly, these documents do not disclose forming a metal complex of formula $M(Ar^1Ar^2)_nL$ by reacting a halo-bridged dimer complex according to formula (I) with a bidentate ligand L of formula Ar^1-Ar^2 in the presence of an enabling ligand capable of breaking the halogen bridge of the complex according to formula I, as claimed.

Claim 13

Similarly, the applied documents also do not disclose forming said halo-bridged dimer and then reacting same with a reactive ligand capable of breaking the halogen bridge in a one pot process, as recited in claim 13. In contrast, the art invariably discloses separating the intermediate halo-bridged dimmer frin the components of the mixture in which it is formed prior to reacting with any reactive ligand capable of breaking the halogen bridge.

CLAIM REJECTIONS 35 U.S.C. §103

Claims 1-5 and 8-17 have been rejected under 35 U.S.C. §103(a) as assertedly obvious over EP 1,349,435 to Kamatani. Claims 1-17 have been rejected under 35 U.S.C. §103(a) as assertedly obvious over WO 02/15645 A1 to Lamansky et al.

The examiner appears to rely on Dorwald as demonstrating that “it is well within the purview of the skilled artisan in the relevant art to reduce steps in order to achieve the desired product faster and in higher yields.” *See* page 9 of the outstanding official action. In this respect, Dorwald discloses:

The synthesis of a structurally complex compound requires careful retrosynthetic analysis to identify the shortest synthetic strategies which are most likely to give rapid access to the target compound, ideally in high yield and purity. It is critical to keep the synthesis as short as possible, because, as discussed throughout this book, each reaction can cause unexpected problems, especially when working with structurally complex intermediates.

Dorwald contemplates redesigning a synthesis to have fewer steps. Admittedly, this goal is not new or revolutionary. Dorwald, however, does not disclose or suggest forming a metal complex of formula $M(Ar^1Ar^2)_nL$ by reacting a halo-bridged dimer complex according to formula (I) with a bidentate ligand L of formula Ar^1-Ar^2 in the presence of an enabling ligand capable of breaking the halogen bridge of the complex according to formula I, as recited in claim 1. Similarly, Dorwald also does not disclose forming a halo-bridged dimer and then reacting same with a reactive ligand capable of breaking the halogen bridge in a one pot process, as recited in claim 13. The applied art invariably teaches *isolating and/or purifying, and further reacting an intermediate product in a separate step*. One of ordinary skill in the art would not have any reasonable expectation that the claimed halo-bridged dimers could be reacted with L, a compound of formula Ar^1-Ar^2 , in the presence of an enabling ligand, to form a metal complex as claimed. Similarly, one of ordinary skill in the art would not have any reasonable expectation that a halo-bridged dimer could be formed and then reacted with a reactive ligand capable of breaking the halogen bridge in a one pot process, as recited in claim 13. Rather, in view of the consistent teachings throughout the applied art to conduct separate reactions, one of ordinary skill in the art would not have a reasonable expectation that the methods, as claimed, would work. And thus one of ordinary skill in the art would not be motivated to arrive at the claimed subject matter.

CONCLUSION

It is submitted that the application is in condition for allowance. Should the examiner wish to discuss any matter of form or procedure in an effort to advance this application to allowance, the examiner is respectfully invited to telephone the undersigned attorney at the indicated telephone number.

Respectfully submitted,

MARSHALL, GERSTEIN & BORUN LLP

April 15, 2010



Andrew M. Lawrence, Reg. No. 46,130
Attorney for Applicant
233 S. Wacker Drive Suite 6300
Chicago, Illinois 60606-6357
(312) 474-6300

INORGANIC CHEMISTRY

DUWARD F. SHRIVER

Northwestern University

P. W. ATKINS

Oxford University

COOPER H. LANGFORD

Concordia University



W. H. Freeman and Company
New York

ATTACHMENT A

Cover image:
Perovskite, computer-generated art courtesy
of IBM UK Scientific Centre

Library of Congress Cataloging-in-Publication Data

Shriver, D. E. (Duward E.), 1934—
Inorganic chemistry / Duward E. Shriver, P. W. Atkins, Cooper H. Langford.

p. cm.
Includes bibliographical references.
ISBN 0-7167-2079-5

1. Chemistry, Inorganic. I. Atkins, P. W. (Peter William), 1940— .
II. Langford, Cooper Harold, 1934— . III. Title.
QD151.5.S57 1990b
546—dc20

89-29386 CIP

Copyright © 1990 by Duward E. Shriver, P. W. Atkins, Cooper H. Langford

No part of this book may be reproduced by any mechanical,
photographic, or electronic process, or in the form of a
phonographic recording, nor may it be stored in a retrieval
system, transmitted, or otherwise copied for public or
private use without the written permission of
Oxford University Press.

Printed in the United States of America

3 4 5 6 7 8 9 0 VB 9 9 8 7 6 5 4 3 2 1 0

This edition has been authorized by the Oxford University Press for sale in the
USA and Canada only and not for export therefrom.

plex.
is shown
ram for
on 3.2,
ess the

d-Metal complexes

We now consider a broad class of compounds in which a central metal atom acting as a Lewis acid forms a complex with several Lewis bases. This chapter differs from the others in this part because we emphasize some new aspects of structure and bonding as well as the reactions of complexes. In this way we can present a general survey of the field known as *coordination chemistry*. Furthermore, for the first time we introduce details of the mechanisms by which chemical reactions occur, and this new theme will grow in importance later in the book.

We shall describe the structures of complexes in terms of *ligand field theory*, which develops the molecular orbital theory of polyatomic molecules we introduced in Chapter 3 by making use of the high symmetry of complexes. Ligand field theory provides an excellent example of how a single parameter—we shall come to know it as the *ligand field splitting*—can be used to correlate a wide range of properties, including structure, spectra, magnetic properties, and some aspects of thermochemistry.

Metal complexes range from hydrated metal ions to complicated metalloenzymes. We concentrate in this introductory chapter on complexes formed by the *d*-block elements, but many of the same ideas apply to complexes of other metals too. Some of the ideas we present are developed further in Chapter 14, and that chapter could be tackled immediately after this.

Structures and symmetries of complexes

- 7.1 Constitution and isomerism
- 7.2 Types of ligands and nomenclature
- 7.3 Chiral complexes

Bonding in complexes

- 7.4 Molecular orbital theory of octahedral complexes
- 7.5 Correlation of theory with experiment
- 7.6 Complexes with lower symmetry

Reactions of complexes

- 7.7 Coordination equilibria
- 7.8 Rates and mechanisms of ligand substitution

Further reading

Exercises

Problems